

## **BIOTECHNOLOGY ITS APPLICATIONS**

1. An important objective of biotechnology in agriculture section is to:
  - (a) increase plant weight
  - (b) decrease seed number
  - (c) increase nitrogen content
  - (d) produce pest resistant varieties of plant
2. Green revolution resulted in the great increase in production of food grains due to:
  - (a) introduction of high-yielding varieties
  - (b) use of pesticides to better management techniques
  - (c) use of agrochemicals
  - (d) all of the above
3. Food production can be increased by:
  - (a) genetically engineered crop-based agriculture
  - (b) agro-chemical based agriculture
  - (c) organic agriculture
  - (d) all of the above
4. Genetically modified organisms (GMO) have been useful for:
  - (a) making crops more tolerant to abiotic stresses
  - (b) helping to reduce post-harvest losses
  - (c) enhancing nutritional value of food
  - (d) all of the above
5. Which of the following is obtained from genetic engineering?
  - (a) Glucose
  - (b) Golden rice
  - (c) Haemoglobin
  - (d) None of these
6. Which of the following has not been synthesized by DNA technology?
  - (a) Insulin
  - (b) Interferon
  - (c) Haemoglobin
  - (d) Somatostatin
7. A transgenic food crop which may help in solving the problem of night blindness in developing countries is:
  - (a) Golden rice
  - (b) Bt Soyabean
  - (c) Starlink maize
  - (d) Flavr Saw tomatoes
8. Golden rice is a transgenic crop of the future with the following improved trait:
  - (a) insect resistance
  - (b) high protein content
  - (c) high vitamin—A content
  - (d) high lysine (essential amino acid) content
9. An improved, variety of transgenic basmati rice:
  - (a) gives high yield and is rich in vitamin A
  - (b) gives high yield but has no characteristic aroma
  - (c) does not require chemical fertilizers and growth hormones
  - (d) is completely resistant to all insect pests and diseases of paddy
10. Golden rice is:
  - (a) long stored rice having yellow colour tint
  - (b) a transgenic rice having gene for 13—carotene
  - (c) wild variety of rice with yellow coloured grains
  - (d) a variety of rice grown along the yellow river in China

11. The problem of blindness in poor countries can be taken care of by using the following:  
(a) Transgenic maize  
(b) Bt brinjal  
(c) Transgenic tomato  
(d) Golden rice

12. A transgenic rice (Golden rice) has been developed for increased content of:  
(a) Vitamin A  
(b) Vitamin B<sub>1</sub>  
(c) Vitamin C  
(d) Vitamin D

13. Vitamin A rich transgenic plant is:  
(a) Bt Cotton  
(b) Golden Rice  
(c) Vaccinated Potato  
(d) Flaw Saw Tomato

14. Golden rice is a variety rich in:  
(a) biotin  
(b) Lysine  
(c) Vitamin C  
(d)  $\beta$ -carotene and ferritin

15. Cultivation of Bt cotton has been much in the news. The prefix "Bt" means:  
(a) "Barium—treated" cotton seeds  
(b) Carrying an endotoxin gene from *Bacillus thuringiensis*  
(c) "Bigger thread" variety of cotton with better tensile strength  
(d) Produced by "biotechnology" using restriction enzymes and ligases

16. What does Bt stand for the popular crop Bt cotton?  
(a) Best  
(b) Best type  
(c) Biotechnology  
(d) *Bacillus tomentosa*  
(e) *Bacillus thuringiensis*

17. The Bt gene for insect resistance was obtained from:  
(a) *B. tumefaciens*  
(b) *B. radicicola*  
(c) *B. thuringiensis*  
(d) *B. amyloliquifaciens*

18. Isolation of Bt gene from bacterium (*Bacillus thuringiensis*) was taken up in the year:  
(a) 1977  
(b) 1981  
(c) 1997  
(d) 1990

19. Bt toxin is obtained from:  
(a) prokaryotes  
(b) eukaryotes  
(c) both (a) and (b)  
(d) none of these

20. A protoxin is:  
(a) inactive toxin  
(b) a primitive toxin  
(c) a denatured toxin  
(d) toxin produced by protozoa

21. What is true about Bt toxin?

- The concerned *Bacillus* has antitoxins.
- Bt protein exists as active toxin in the *Bacillus*.
- The inactive protoxin gets converted into active form in the insect gut.
- The activated toxin enters the ovaries of the pest to sterilise it and thus prevent its multiplication.

22. If you engineer the gene for Bt toxin from *Bacillus thuringiensis* into a tomato plant, the resulting plant will be:

- die
- have a *Bacillus* infection
- to be toxic to insect that eat the plants
- be toxic to human who eat the tomatoes

23. Which one of the following bacterium is used extensively as biopesticide?

- Bacillus subtilis*
- Streptococcus lactis*
- Bacillus thuringiensis*
- Lactobacillus acidophilus*

24. Which of these is not correct regarding Bt cotton?

- No such plant is heard of
- It is a disease/resistant plant
- It produces more yield of cotton
- It has been obtained by recombination

25. The protein toxin producing bacteria, which used to control biological pest is :

- E. coli*
- Agrobacterium*
- Mycobacterium* sp.
- B. thuringiensis*

26. *Bacillus thuringiensis* (Bt) strains have been used for designing novel:

- Biofertilizers
- Bioinsecticidal plants
- Biometallurgical techniques
- Biomineralization processes

27. Match List I with List II and select the correct option:

List I	List II
A <i>Bacillus thuringiensis</i>	1 Production of chitinases
B <i>Rhizobium meliloti</i>	2 Scavenging of oil spills
C <i>Escherichia coli</i>	3 Incorporation of nif gene
D <i>Pseudomonas putida</i>	4 Production of Bt toxin
E <i>Trichoderma</i>	5 Production of human insulin

- A — 2, B — 4, C — 1, D — 5, E — 3
- A — 2, B — 4, C — 5, D — 1, E — 3
- A — 4, B — 3, C — 5, D — 2, E — 1
- A — 3, B — 4, C — 5, D — 1, E — 2
- A — 4, B — 2, C — 5, D — 3, E — 1

28. Bt cotton is resistant to:

- insects
- herbicides
- salt resistant
- drought resistant

29. Bt cotton genes repel:  
(a) bacterial pathogens  
(b) fungal pathogens  
(c) nematode parasites  
(d) insect pests

30. *Bacillus thuringiensis* is used to control:  
(a) bacterial pathogens  
(b) fungal pathogens  
(c) nematodes  
(d) insect pests

31. *cryII Ab* and *cry I Ab* produce toxins that control:  
(a) cotton boll worm and corn borer respectively  
(b) corn borer and cotton bollworm respectively  
(c) tobacco budworms and nematodes respectively  
(d) nematodes and tobacco budworms respectively  
(e) corn borer and tobacco budworms respectively

32. Bt cotton is not:  
(a) AGM plant  
(b) Insect resistant  
(c) Resistant to all pesticides  
(d) A bacterial gene expressing system

33. The trigger for activation of toxin of *Bacillus thuringiensis* is:  
(a) high temperature  
(b) alkaline pH of gut  
(c) acidic pH of stomach  
(d) mechanical action in the insect gut

34. First genetically modified plant commercially released in India is:  
(a) Bt-bringal  
(b) Bt-cotton  
(c) Golden rice  
(d) Slow ripening tomato

35. Some of the characteristics of Bt cotton are:  
(a) Long fibre and resistance to aphids  
(b) High yield and resistance to bollworms  
(c) Medium yield, long fibre and resistance to beetle pests  
(d) High yield and production of toxic protein crystals which kill dipteran pests

36. The protein products of the following Bt toxin genes *cry1Ac* and *cry1Ab* are responsible for controlling:  
(a) Moth  
(b) Fruit fly  
(c) Bollworm  
(d) Roundworm

37. Crystals of Bt toxin produced by some bacteria do not kill the bacteria because:  
(a) toxin is inactive  
(b) toxin is immature  
(c) bacteria are resistant to toxin  
(d) bacteria enclose toxin in a special sac

38. The genetically-modified (GM) brinjal in India has been developed for:  
(a) Insect-resistance  
(b) Enhancing shelf life  
(c) Drought-resistance  
(d) Enhancing mineral content

39. Flavr Savr variety of tomato is a:

- (a) high yielding variety
- (b) transgenic crop
- (c) mutated form
- (d) somaclonal variety

40. An example of gene silencing is:

- (a) Bt Cotton
- (b) Transgenic rice
- (c) Flavr savr tomato
- (d) Transgenic Maize

41. What is antisense technology?

- (a) RNA polymerase producing DNA
- (b) Production of somaclonal variants in tissue cultures
- (c) A cell displaying a foreign antigen used for synthesis of antigens
- (d) When a piece of RNA that is complementary in sequence is used to stop expression of a specific gene

42. In RNAi, genes are silenced using:

- (a) ds RNA
- (b) ss RNA
- (c) ss DNA
- (d) ds DNA

43. Silencing of a gene could be achieved through the use of:

- (a) short interfering RNA (RNAi)
- (b) antisense RNA
- (c) by both of the above
- (d) none of the above

44. RNA interference technique is used successfully to control the nematode:

- (a) Loa loa
- (b) Necator americanus
- (c) Rhabditis maupasi
- (d) Meloidogyne incognita

45. The process of RNA interference has been used in the development of plants resistant to:

- (a) insects
- (b) fungi
- (c) viruses
- (d) nematodes

46. Silencing of mRNA has been used in producing transgenic plants resistant to.

- (a) bollworms
- (b) nematodes
- (c) white rusts
- (d) bacterial blights

47. The Nobel Prize in Physiology or Medicine 2006 was awarded jointly to Andrew Z. Fire and Craig C. Mello for:

- (a) RNA interference — gene silencing by double-stranded RNA technique.
- (b) hybridoma technology for the production of monoclonal antibodies
- (c) invention of polymerase chain reaction
- (d) recombinant DNA technology

48. Genetically engineered bacteria are being used in commercial production of:

- (a) melatonin
- (b) thyroxine
- (c) human insulin
- (d) testosterone

49. Humulin is aian:

- (a) fat
- (b) acid
- (d) protein
- (c) carbohydrate

50. Humulin is:

- (a) human insulin
- (b) a form of chitin
- (c) a powerful antibiotic
- (d) a new digestive enzyme

51. The first genetically engineered human insulin was launched in the year:

- (a) 1975
- (b) 1990
- (c) 1993
- (d) 1983

52. First hormone prepared artificially by culturing bacteria was:

- (a) insulin
- (b) oxytocin
- (c) adrenaline
- (d) somatotropin

53. First biochemical to be produced commercially by microbial cloning and genetic engineering is:

- (a) interferons
- (b) penicillin
- (c) human insulin
- (d) fertility factors

54. C-peptide of human insulin is:

- (a) A part of mature insulin molecule
- (b) Responsible for its biological activity
- (c) Responsible for formation of disulphide bridges
- (d) Removed during maturation of pro-insulin to insulin

55. Maturation of genetically engineered proinsulin into insulin takes place after:

- (a) joining of c-peptide
- (b) removal of c-peptide
- (c) removal of disulphide bridge
- (d) all of the above

56. The first genetically engineered human insulin was launched in the year :

- (a) 1975
- (b) 1993
- (c) 1990
- (d) 1983

57. Human insulin is being commercially produced from a transgenic species of:

- (a) Rhizobium
- (b) Escherichia
- (c) Saccharomyces
- (d) Mycobacterium

58. Which of the following is produced by genetically engineered bacteria:

- (a) Thyroxine
- (b) Insulin
- (c) Glucagon
- (d) ADH



68. Which of these is used as vector in gene therapy for SLID?

- (a) Arbovirus
- (b) Rotavirus
- (c) Retrovirus
- (d) Enterovirus
- (e) Parvovirus

69. The genetic defect-adenosine deaminase (ADA) deficiency may be cured permanently by:

- (a) enzyme replacement therapy.
- (b) administering adenosine deaminase activators.
- (c) periodic infusion of genetically engineered lymphocytes having functional ADA cDNA.
- (d) introducing bone marrow cells producing ADA into cells at early embryonic stages.

70. Find the incorrect statement:

- (a) Gene therapy is a genetic engineering technique used to treat disease at molecular level by replacing defective genes with normal genes.
- (b) Calcitonin is a medically useful recombinant product in the treatment of infertility.
- (c) Bt.toxin is a biodegradable insecticide obtained from *Bacillus thuringensis*.
- (d) *Trichoderma* sp. is a biocontrol agent for fungal diseases of plants.
- (e) Totipotency is the potential ability of a cell to develop into a complete plant.

71. Small oligonucleotides capable of recognising complementary sequence are known as:

- (a) cDNA
- (b) Hybridoma
- (c) Repetitive DNA
- (d) Molecular probes

72. A molecular probe might be used to:

- (a) find a nucleotide sequence
- (b) insert gene into a host cell
- (c) make DNA for gene cloning
- (d) cut pieces of DNA down to manageable size

73. A probe which is a molecule used to locate specific sequences in a mixture of DNA or RNA molecules could be:

- (a) A single stranded RNA
- (b) A single stranded DNA
- (c) Either RNA or DNA
- (d) Can be ss DNA but not ss RNA

74. The DNA probe CTTCAAT will hybridize DNA containing:

- (a) GAAGTTA
- (b) GUUGAAU
- (c) CTTCAAT
- (d) GAAGAAT

75. ELISA is used to detect viruses where the key reagent is:

- (a) DNA probe
- (b) RNase
- (c) Alkaline phosphatase
- (d) Catalase

76. Hybridoma technology was developed by:

- (a) Taggart 1982
- (b) Vitella et al. 1982
- (c) Prie and Saxton 1987
- (d) Milstein and Kohler 1982

77. Hybridoma technology has been successfully used in:

- (a) synthesis of haemoglobin
- (b) production of alcohol in bulk
- (c) production of somatic hybrids
- (d) synthesis of monoclonal antibodies

78. Monoclonal antibody is produced from:

- (a) hybridoma
- (b) melanoma
- (c) myeloma
- (d) B-lymphocyte

79. Cesar Milstein and Georges J. F. Kohler developed biotechnology for the production of:

- (a) myelomas
- (b) steroid conversion
- (c) immobilised enzymes
- (d) monoclonal antibodies

80. Milstein and Kohler won the Nobel Prize for the development of monoclonal antibodies in the year:

- (a) 1978
- (b) 1975
- (c) 1984
- (d) 1991

81. The cells obtained from cancerous tumours are known as:

- (a) myelomas
- (b) hybridomas
- (c) lymphocytes
- (d) monoclonal cells

82. Which is employed for synthesis of monoclonal antibody by hybridoma technique?

- (a) RBCs
- (b) Liver cells
- (c) Tumour cells
- (d) Nerve cells

83. 'Hybridoma' refers to:

- (a) DNA-RNA hybrid molecules
- (b) DNA-DNA hybridized molecules
- (c) fused somatic cells of different types, one of them derived from a tumour
- (d) fused gametic cells of two opposite sexes one of them being derived from a tumour-bearing patient

84. Hybridomas are the fusion product of:

- (a) normal antibody producing cell with myeloma
- (b) abnormal antibody producing cell with myeloma
- (c) sex cells with myeloma
- (d) bone cells with myeloma

85. Hybridoma is a biotechnology which involves fusion of:

- (a) B-cell with T-cell
- (b) T-cell with spleen cell
- (c) Spleen cell with myeloma cell
- (d) Myeloma cell with B-cell

86. Magic bullets are the:

- (a) anabolic steroids
- (b) recombinant vaccines
- (c) monoclonal antibodies
- (d) chemotherapy drugs for cancer

87. Hybridoma is connected with:

- (a) Monoclonal antibody formation
- (b) Antibody -antigen interaction
- (c) Activity of NK cells
- (d) Growth of cancer

88. The first vaccine for human use produced using recombinant DNA technology was:

- (a) AIDS vaccine
- (b) MMR vaccine
- (c) Polio vaccine
- (d) Hepatitis B vaccine

89. Hepatitis B vaccine is a:

- (a) Second generation vaccine
- (b) Third generation vaccine
- (c) First generation vaccine
- (d) None of the above

90. Vaccines prepared through recombinant DNA technology are called:

- (a) First generation vaccines
- (b) Second generation vaccines
- (c) Third generation vaccines
- (d) None of the above

91. Genetic engineering is employed to produce vaccines for:

- (a) Herpes virus
- (b) Hepatitis B
- (c) Both of these
- (d) None of these

92. Transgenic plants are:

- (a) plants having no gene
- (b) plants in which genes have no function to perform
- (c) plants into which genes of another organism have been implanted
- (d) plants in which genes are present in an opposite or transposition

93. Transgenic plants are the ones:

- (a) generated by introducing foreign DNA into a cell and regenerating a plant from that cell.
- (b) grown in artificial medium after hybridization in the field.
- (c) produced after protoplast fusion in artificial medium.
- (d) produced by a somatic embryo in artificial medium.

94. Main objective of production of herbicide resistant GM crop is to:

- (a) encourage ecofriendly herbicides
- (b) reduce herbicide accumulation in food articles for health safety
- (c) eliminate weeds from fields without the use of herbicides
- (d) eliminate weeds from fields without use of herbicides

95. Transgenic hirudin is obtained from:

- (a) Potato
- (b) Tomato
- (c) Brassica napus
- (d) Ocimum sanctum

96. Which one of the following bacteria has found extensive use in genetic engineering work in plants?

- (a) Xanthomonas citri
- (b) Bacillus coagulans
- (c) Clostridium septicum
- (d) Agrobacterium tumefaciens

97. Natural genetic engineer is:

- (a) Agrobacterium tumefaciens
- (b) Bacillus subtilis
- (c) Pseudomonas spp
- (d) Escherichia coli

98. In plant biotechnology, PEG is used in:

- (a) Hardening
- (b) Protoplast fusion
- (c) Protoplast isolation
- (d) Cell culture preparation

99. Which one of the following bacterium is used for production of transgenic plants:

- (a) Escherichia coli
- (b) Bacillus thuringiensis
- (c) Staphylococcus aureus
- (d) Agrobacterium tumefaciens

100. Which of the following would be considered a transgenic organism?

- (a) A rat with rabbit haemoglobin genes
- (b) A bacterium that has received genes via conjugation
- (c) A fern grown in cell culture from a single fern root cell
- (d) A human treated with insulin produced by E. coli bacteria

101. Genetic engineering has been successfully used for producing:

- (a) transgenic mice for testing safety of polio vaccine before use in humans
- (b) transgenic models for studying new treatments for certain cardiac diseases
- (c) transgenic Cow-Rosie which produces high fat milk for making ghee
- (d) animals like bulls for farm work as they have super power

102. Maximum number of existing transgenic animals is of:

- (a) Pig
- (b) Fish
- (c) Mice
- (d) Cow

103. Transgenic animals have been used:

- (a) for testing safety of vaccines
- (b) for testing toxicity of drugs
- (c) to produce useful biological products
- (d) all of the above

104.  $\alpha$  -1 antitrypsin is:

- (a) An antacid
- (b) An enzyme
- (c) Used to treat arthritis
- (d) Used to treat emphysema

105. The protein  $\alpha$ -1 antitrypsin is used to treat the disease:

- (a) Cancer
- (b) Emphysema
- (c) Rheumatoid arthritis
- (d) Alzheimer's disease
- (e) ADA deficiency disease in children

106. Which transgenic animal has been given human genes for organ transplantation into humans without risk of rejection?

- (a) Pig
- (b) Cow
- (c) Sheep
- (d) Goat

107. Which one of the following techniques made it possible to genetically engineer living organisms?

- (a) Hybridization
- (b) X-ray diffraction
- (c) Heavier isotope labelling
- (d) Recombinant DNA techniques

108. Recombinant DNA or rDNA technology was discovered by:

- (a) Watson
- (b) Khorana
- (c) Sutton and Boveri
- (d) Cohen and Boyer
- (e) Bateson and de Vries

109. Recombinant DNA technology can be used to produce large quantities of biologically active form of which one of the following products in *E. coli*?

- (a) Interferon
- (b) Ecdysone
- (c) Rifampicin
- (d) Luteinizing hormone

110. Name of the drug used in cancer treatment produced by using biotechnology:

- (a) HGH
- (b) TSH
- (c) Interferon
- (d) Insulin
- (e) Terramycin

111. Tissue plasmin activator:

- (a) dissolve clot in blood vessels of heart
- (b) help in wound healing
- (c) allergy response
- (d) none of these

112. The name of the drug used in cancer treatment produced by biotechnology is:

- (a) TSH
- (b) HGH
- (c) Insulin
- (d) Interferon

113. A genetically engineered microbe utilized for cleaning oil spills is:

- (a) *Bacillus subtilis*
- (b) *Escherichia coli*
- (c) *Pseudomonas putida*
- (d) *Agrobacterium tumefaciens*

114. The bacterium *Pseudomonas* is useful because of its ability to:

- (a) fix atmospheric nitrogen in the soil
- (b) produce a wide variety of antibiotics
- (c) transfer genes from one plant to another
- (d) decompose a variety of organic compounds

115. Genetically engineered microorganism used successfully in bioremediation of oil spills is:

- (a) *Bacillus*
- (b) *Trichoderma*
- (c) *Xanthomonas*
- (d) *Pseudomonas*

116. Match the following and choose the correct combination from the options given:

Column I	Column II
A Escherichia colt	1 'M' gene
B Rhizobium meliloti	2 Digestive hydrocarbons of crude oil
C Bacillus thuringensis	3 Human insulin production
D Pseudomonas putida	4 Biocontrol of fungal disease
	5 Biodegradable insecticide

(a) A = 3, B = 1, C = 5, D = 4

(b) A = 1, B = 2, C = 3, D = 4

(c) A = 2, B = 1, C = 3, D = 4

(d) A = 4, B = 3, C = 1, D = 2

(e) A = 3, B = 1, C = 5, D = 2

117. Which of the following gene is responsible for biological nitrogen fixation ?

(a) Nif gene

(b) Nitrogenase

(c) RNA synthetase

(d) Yeast alanine t-RNA synthetase

118. A regulatory body working under MoEF for the release of transgenic crops is:

(a) NBPGR

(b) GEAC

(c) NSC

(d) NIPGR

119. GEAC stands for:

(a) Genome Engineering Action Committee

(b) Ground Environment Action Committee

(c) Genetic Engineering Approval Committee

(d) Genetic and Environment Approval committee

120. Choose the correct option regarding Retrovirus:

(a) A ssDNA virus

(b) A dsRNA virus

(c) A DNA virus that can synthesise RNA during infection

(d) An RNA virus that can synthesise DNA during infection

121. A patent is a monopoly granted to a person for:

(a) making an improvement of an existing article

(b) inventing a new process of making an article

(c) invention of a new and useful article

(d) all of the above

122. The criteria for a patent are:

(a) utility

(b) novelty

(c) inventiveness

(d) all of these

123. The patent is grant for a fixed period of time, generally for:

(a) five years

(b) ten years

(c) twenty years

(d) fifteen years

124. Illegal and unlawful development of biomaterials without payment to inhabitants of their region is called:

(a) biowar

(b) biopiracy

(c) biopatent

(d) biotechnology

125. Which of the following is used as biological warfare agent?

- (a) Smallpox virus
- (b) Bacillus anthracis
- (c) Both of these
- (d) None of these

126. What right does a patent-holder

- (a) Right to make
- (b) Right to use
- (c) Right to export
- (d) All of these

127. The unauthorized publication or reproduction of another's material is termed:

- (a) piracy
- (b) theft
- (c) dacoity
- (d) robbery

128. Bioweapons are :

- (a) invisible
- (b) low cost
- (c) difficult to detect
- (d) all of these

129. Which of the following is/are true?

1. Biowar Biowar is the use of biological weapons against humans and or their crops and animals
2. Bioethics Bioethics is the unauthorised use of bioresources and traditional knowledge related to bioresources for commercial benefits
3. Biopatent Exploitation of bioresources of other nations without proper authorisation

- (a) 2 only
- (b) 1 only
- (c) 1 and 2 only
- (d) 1 and 3 only
- (e) 2 and 3 only